Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

36 Bradfield Road, West Lindfield NSW 2070

Certificate of Approval

NMI 6/20A/13

Issued by the Chief Metrologist under Regulation 60
of the
National Measurement Regulations 1999

This is to certify that an approval for use for trade has been granted in respect of the instruments herein described.

Pfreundt Model WK60 Wheeled Loader Weighing Instrument

submitted by Pfreundt GmbH
Robert-Bosch-Strasse 5
46354 Südlohn
Germany

NOTE: This Certificate relates to the suitability of the pattern of the instrument for use for trade only in respect of its metrological characteristics. This Certificate does not constitute or imply any guarantee of compliance by the manufacturer or any other person with any requirements regarding safety.

This approval has been granted with reference to document NMI R 51, *Automatic Catchweighing instruments,* dated August 2009.

This approval becomes subject to review on **1/12/23**, and then every 5 years thereafter.

DOCUMENT HISTORY

Rev	Reason/Details	Date
0	Pattern & variants 1 to 5 approved – certificate issued	2/11/18

CONDITIONS OF APPROVAL

General

Instruments purporting to comply with this approval shall be marked with pattern approval number 'NMI 6/20A/13' and only by persons authorised by the submittor.

It is the submittor's responsibility to ensure that all instruments marked with this approval number are constructed as described in the documentation lodged with the National Measurement Institute (NMI) and with the relevant Certificate of Approval and Technical Schedule. Failure to comply with this Condition may attract penalties under Section 19B of the National Measurement Act and may result in cancellation or withdrawal of the approval, in accordance with document NMI P 106.

Auxiliary devices used with this instrument shall comply with the requirements of General Supplementary Certificate No S1/0B.

This approval shall NOT be used in conjunction with General Certificate No 6B/0.

Special Conditions of Approval:

For this type of instrument, the ability to perform within the specified maximum permissible errors can depend substantially on characteristics of the wheeled loader to which it is fitted. Some designs of wheeled loaders simply may not be suitable for attachment of this weighing instrument, however the National Measurement Institute is unable to clearly define particular wheeled loaders, or categories of wheeled weighers, for which the instrument is unsuitable.

It is the responsibility of the submittor (Pfreundt) to exercise control over any installation to ensure compliance with this approval and to ensure performance within the appropriate maximum permissible errors.

In the event of unsatisfactory performance this approval may be withdrawn.

Signed by a person authorised by the Chief Metrologist to exercise their powers under Regulation 60 of the *National Measurement Regulations 1999*.

Darryl Hines
Manager
Pattern Approval, Policy and Licensing Section

TECHNICAL SCHEDULE No 6/20A/13

1. Description of Pattern approved on x/10/18

The Pfreundt model WK60 class Y(b) automatic catchweighing instrument (Figure 1e) of 10 000 kg maximum capacity with a verification scale interval of 50 kg fitted to a Volvo model L120H wheeled loader.

The Pfreundt model WK60 automatic catchweighing instrument comprises electronic equipment and sensors attached to a wheeled loader (i.e. typically 'front end loader') which automatically determine the load lifted by the lifting mechanism of the loader during the lifting process. Figure 1a shows a typical installation.

The electronic equipment and sensors are described below.

Instruments may be fitted with output sockets (output interfacing capability) for the connection of auxiliary and/or peripheral devices.

1.1 Pressure Sensor(s)/Temperature Control

Two (2) Pfreundt model CP8* digital pressure sensors (Figure 2) with integrated temperature control of 500 bar maximum range are used. The strain gauge type pressure sensors measure the pressure acting on the piston in the lift cylinder(s).

The temperature of the hydraulic fluid is measured after each weight determination. A zero setting operation is requested automatically by the system if the temperature variation exceeds 10 °C.

Note: "*" may be numerals other than '0', but these represent device identifications which are not metrologically significant.

1.2 Boom Angle Sensor

A Pfreundt model CLS1-# 2-axis inclination sensing device (Figure 3) mounted to the boom measures the angular position of the boom relative to the reference (level) condition. The correct position for a weight determination is when the loading arm is passing within a weighing zone.

Note: "#" may be A, B or C, but these represent device identifications which are not metrologically significant.

1.3 Load Receptor (Bucket) Location Sensor

The Pfreundt model CLS1-# 2-axis inclination sensing device (Figure 4) is located to detect when the load receptor (bucket) is in the correct location (i.e. the bucket is fully rotated 'crowded' back, so that the load will fall into the centre of the bucket). The system will inhibit weighing if the load receptor is not in this location.

1.4 Chassis Inclination Sensor

A Pfreundt model CLS1-# 2-axis inclination sensing device attached to chassis of the vehicle (Figure 5) detects the degree to which the vehicle is tilted from its reference (level) condition, and allows the system to disable weight determination if 6 degrees of tilt is exceeded.

1.5 Pfreundt WK60 Control and Display Unit

The Pfreundt WK60 control and display unit (Figure 6) has an LCD touchscreen display on which the weighing results as well as instructions, alarm or error messages are displayed.

1.6 Printer Unit

A Pfreundt model PPrinter printing unit (Figure 7) is attached to the Pfreundt WK60 control and display unit and can print load tickets automatically or by manual command.

The printout will print information to identify the particular 'delivery' (a unique job number, time and date), the weight value of a single load (lift) or a total of the loads. Additional information may also be printed (product description, customer name, etc).

The instrument includes provision for electronic storage of the weight value of each load (lift) to permit checking of it in the case of dispute.

Note: A Pfreundt model PPrinter printing unit is a typical example only – other model printers may be used.

1.7 Additional Features

The system has certain additional functions:

- A function in which a particular target total weight is set. The material is delivered (e.g. loaded into a truck) by a number of lifts, and after each lift the display provides an indication of the material still to be delivered to obtain the target total weight.
- A totalisation facility.
- An 'auto enter' facility allowing each weight value to be automatically accepted (added to total and printed).
- A 'live last bucket' facility allowing adjustment of the final lift quantity. Once the quantity has been adjusted the load receptor must be lowered and re-lifted before the weight value is entered.
- Provision for storage of customer details.
- Provision for storage of product details.
- Provision for storage of pre-set target total values.
- Provision for storage of batch data (e.g. recipes of various target totals of different products.

The instrument may have other additional functions. These functions (other than the indications of measured mass - i.e. gross, tare, net, totals - displayed either on the indicator or on an auxiliary or peripheral device), are not approved for trade use.

1.8 Alternative Load Receptors

It is possible for the system to be calibrated with a number of different load receptors (i.e. different attachments to the lifting system). The system shall be verified for each different load receptor, and clear identification of the attachment shall be provided and shall correspond to the identification of the attachment in use which is indicated at the Pfreundt WK60 control and display unit.

Use with load receptors other than those with which the system has been verified is not approved.

1.9 Power Supply

The instrument is powered by the vehicle power supply (battery) of 24 V DC.

1.10 Zero

The instrument has a (dynamic) semi-automatic zero-setting device with a nominal range of not more than 4% of the maximum capacity of the instrument.

A zero setting operation, with a nominal range of not more than 4% of the maximum capacity of the instrument, may be selected through the menu system, or it may be requested automatically by the system (e.g. after completion of a delivery, or after a number of lifts have been carried out without zeroing, or after switching on). The zero-setting must be repeated every 30 minutes.

Zero is set (to within ±0.25e) by raising the empty load receptor (according to instructions on the display). When zero has been set, the normal weighing mode screen is displayed.

1.11 Interfaces

The instrument may be fitted with interfaces for the connection of auxiliary and/or peripheral devices. Any interfaces shall comply with clause 4.2.4 of document NMI R51 (the basic intent of which is that it shall not be possible to alter weighing results via the interfaces).

Any measurement data output from the instrument or its interfaces shall only be used for trade in compliance with NMI General Supplementary Certificate No S1/0B (in particular in regard to the data and its format).

Indications other than the indications of measured mass (i.e. gross, tare, net, totals) displayed either on the indicator or on an auxiliary or peripheral device, are not for trade use.

Instruments may be fitted with interfaces with RS-232 serial data interface, Ethernet, USB interfaces, CAN, WiFi, UMTS, GPS, proximity switch inputs, digital input and analogue signal input.

1.12 Verification Provision

Provision is made for the application of a verification mark.

1.13 Descriptive Markings and Notices

Instruments carry the following markings:

Manufacturer's mark, or name written in full	Pfreundt GmbH	
Indication of accuracy class	Y(b)	
Pattern approval mark for the instrument	NMI 6/20A/13	
Maximum capacity	*Max* ..... kg	#1
Minimum capacity	*Min* ..... kg	#1
Verification scale interval	*e* = ... kg	#1
Serial number of the instrument .	.....	

#1 These markings shall also be shown near the display of the result if they are not already located there.

1.14 Software

Instruments are fitted with Windows Embedded Compact 2013 software and Pfreundt measurement software 2.5.xx.xxxxx, where 'xx.xxxxx' represents the identification of non-legally relevant software.

The software is identified by a checksum number 7782F99C.

The instructions for accessing the legally relevant version are as follows (starting from the normal weighing mode):

- Press ⊕ key.
- Press the '**i**' key. The software version, number and ID are displayed.

1.15 Sealing Provision

Provision is made for the calibration adjustments to be sealed.

- The digital pressure sensors and inclination sensors shall be sealed by recording the serials numbers in the WK60 to seal against replacement.

  Evidence of alteration of the sensor is provided by an audit trail. The audit trail records each change to the sensor and its parameters, including all information from the creation to the latest modifications.

  Access to the audit trail may be obtained by the following procedure:

  a) In the normal weighing mode, press ⊖ key.

  b) Select the 'Diagnostics' and then press ⊕ key until 'Error list Bootloader' is displayed to view the audit trail information.

- Provision is made for the calibration to be sealed by setting a switch on the eMMC board within the instrument to an OFF position, and then preventing access to the calibration switch and replacement of the eMMC board within the instrument housing.

  It is possible to determine that the switch status is in the 'OFF' position as follows:

  If the calibration switch is in the 'OFF' position, the background of electronic descriptive markings will display white colour. In this case the instrument may be verified.

  Otherwise the background will display magenta colour in which case the instrument should not be verified until the switch has been correctly located in the 'OFF' position.

  Sealing to prevent access to the calibration switch may be achieved by applying destructible labels placed over the calibration switch and a join between the eMMC board and instrument housing as shown in Figure 11b.

2. Description of Variant 1 **approved on 2/11/18**

The Pfreundt model WK60 class Y(b) automatic catchweighing instrument similar to the pattern but having proximity switches and an LS1 inclination sensor. Figure 1b shows a typical installation.

2.1 Boom Angle Sensor

A Pfreundt model N1 dual sensor proximity switch (Figure 8a) mounted to the chassis measures the angular position of the boom relative to the reference (level) condition. The correct position for a weight determination is when the loading arm is passing within a weighing zone.

The direction of travel of the lifting arm (ascending or descending) is established by the signal change.

2.2 Load Receptor (Bucket) Location Sensor

The Pfreundt model N2 location sensor (Figure 8b) is located to detect when the load receptor (bucket) is in the correct location (i.e. the bucket is fully rotated 'crowded' back, so that the load will fall into the centre of the bucket). The system will inhibit weighing if the load receptor is not in this location.

2.3 Cabin Inclination Sensor

A Pfreundt model LS1 2-axis level sensing device attached to cabin of the vehicle (Figure 7c) detects the degree to which the vehicle is tilted from its reference (level) condition, and allows the system to disable weight determination if 3 degrees of tilt is exceeded

3. Description of Variant 2 **approved on 2/11/18**

The Pfreundt model WK60 class Y(b) automatic catchweighing instrument similar to the pattern and variant 1 but fitted to different wheeled loaders which may also have different maximum capacities.

Instruments are approved for use with up to 200 verification scale intervals.

4. Description of Variant 3 **approved on 2/11/18**

Similar to the pattern but fitted to a Liebherr model T32-7S wheeled loaders with a retractable lifting mechanism (boom) with a boom extension sensor to ensure that the boom is fully retracted during weighing (see Figure 1f). Figure 1c shows a typical installation.

Instruments are approved for use with up to 150 verification scale intervals.

4.1 Pressure Sensor(s)

Three or four Pfreundt model CP8* digital pressure sensors are used, depending on the type of lifting system involved.

4.2 Boom Position Sensor (for Telescopic Loaders)

The Pfreundt model N3 location sensor (Figure 9) is located to detect when the boom extension is in the correct location (i.e. the boom is fully retracted back). The system will inhibit weighing if the boom is not in this location.

The N3 location sensor may be fitted to the underside of the telescopic arm.

4.3 Load Receptor (Bucket) Location Sensor

The Pfreundt model N2 location sensor (Figure 10) is located to detect when the load receptor (bucket) is in the correct location (i.e. the bucket is fully rotated 'crowded' back, so that the load will fall into the centre of the bucket). The system will inhibit weighing if the load receptor is not in this location.

The location information may be transmitted by a Pfreundt radio transmitter to the receiver which is attached to the Pfreundt WK60 control and display unit.

5. Description of Variant 4 **approved on 2/11/18**

The Pfreundt model WK 60 class Y(b) automatic catchweighing instrument similar to variant 3 but having proximity switches and an LS1 inclination sensor. Figure 1d shows a typical installation.

Instruments are approved for use with up to 150 verification scale intervals.

5.1 Boom Angle Sensor

A Pfreundt model N1 dual sensor proximity switch mounted to the chassis measures the angular position of the boom relative to the reference (level) condition. The correct position for a weight determination is when the loading arm is passing within a weighing zone.

5.2 Cabin Inclination Sensor

A Pfreundt model LS1 2-axis level sensing device attached to cabin of the vehicle detects the degree to which the vehicle is tilted from its reference (level) condition, and allows the system to disable weight determination if 3 degrees of tilt is exceeded.

6. Description of Variant 5 approved on 2/11/18

The Pfreundt model WK 60 class Y(b) automatic catchweighing instrument similar to variants 3 and 4 but fitted to different telescopic wheeled loaders which may also have different maximum capacities.

Instruments are approved for use with up to 150 verification scale intervals.

TEST PROCEDURE

Instruments shall be tested in accordance with any relevant tests specified in the National Instrument Test Procedures.

Maximum Permissible Errors

The maximum permissible errors are specified in Schedule 1 of the *National Trade Measurement Regulations 2009*.

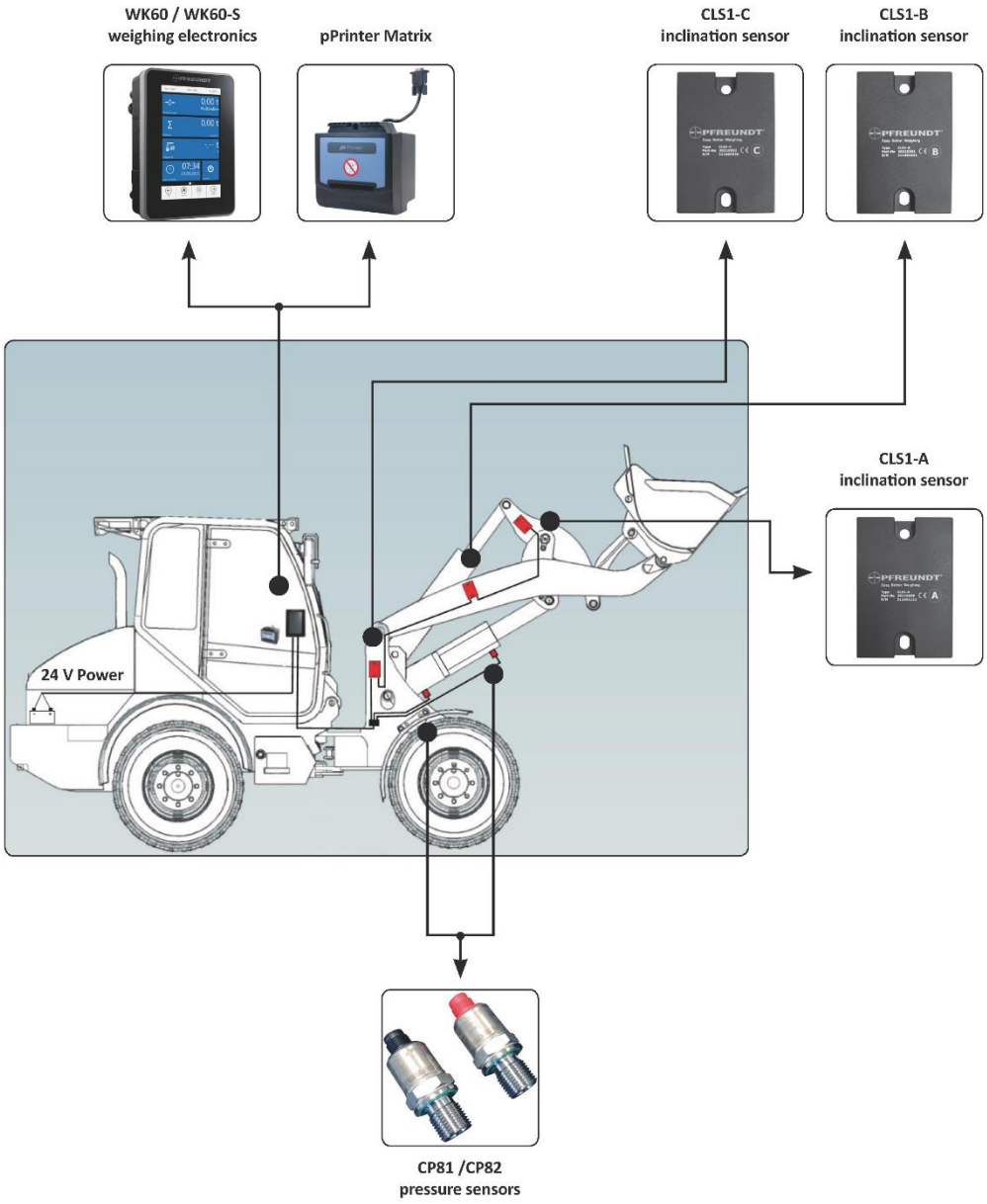
Additional Tests

Totalisation of the loads shall be checked by comparison with the individual measurement values stored in the integral electronic storage device.

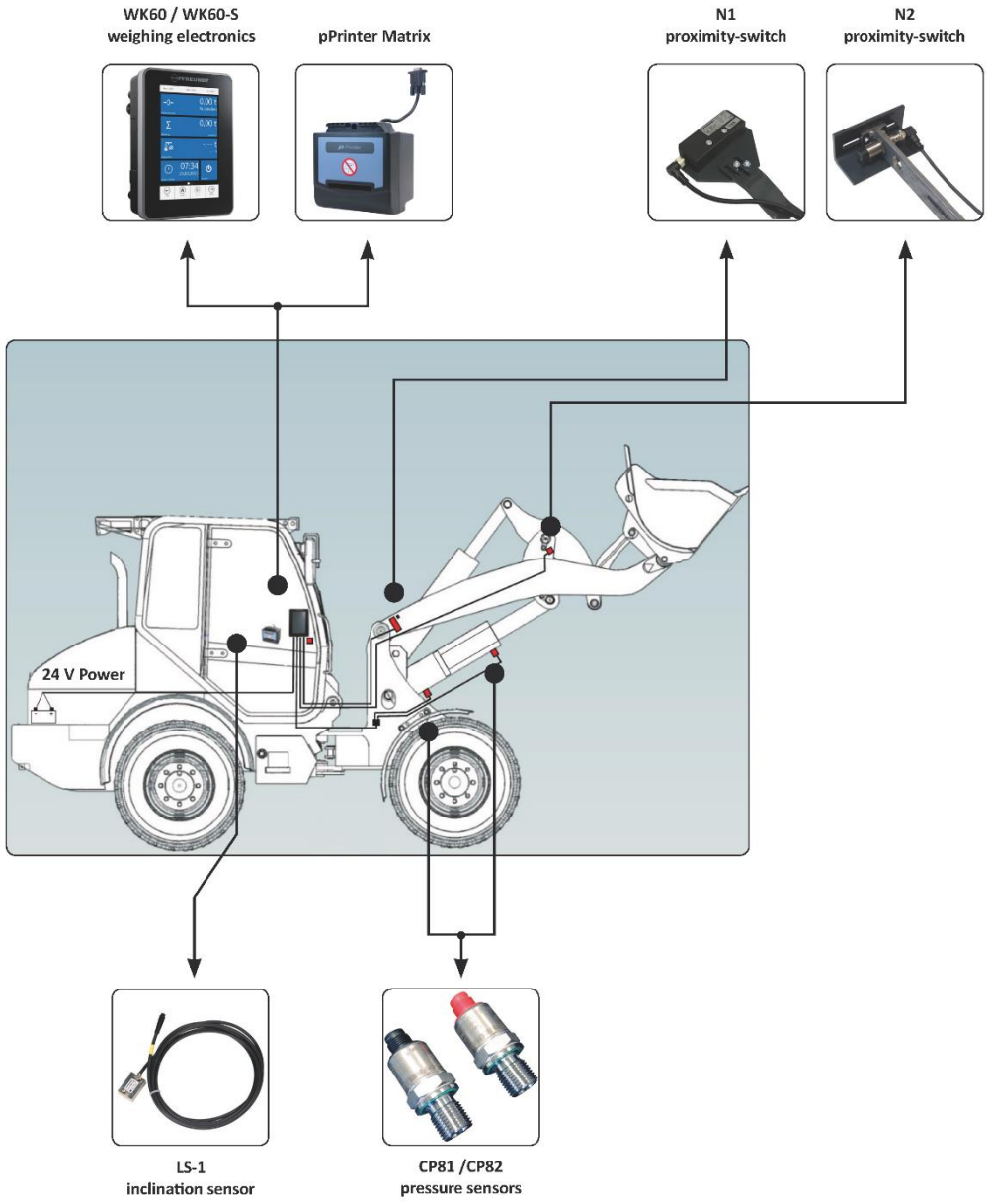
Carry out five measurements on the instrument and print a ticket.

The value printed on the ticket shall equal the arithmetic sum of the measurement values retrieved from the electronic storage device and displayed on the instrument being summed.

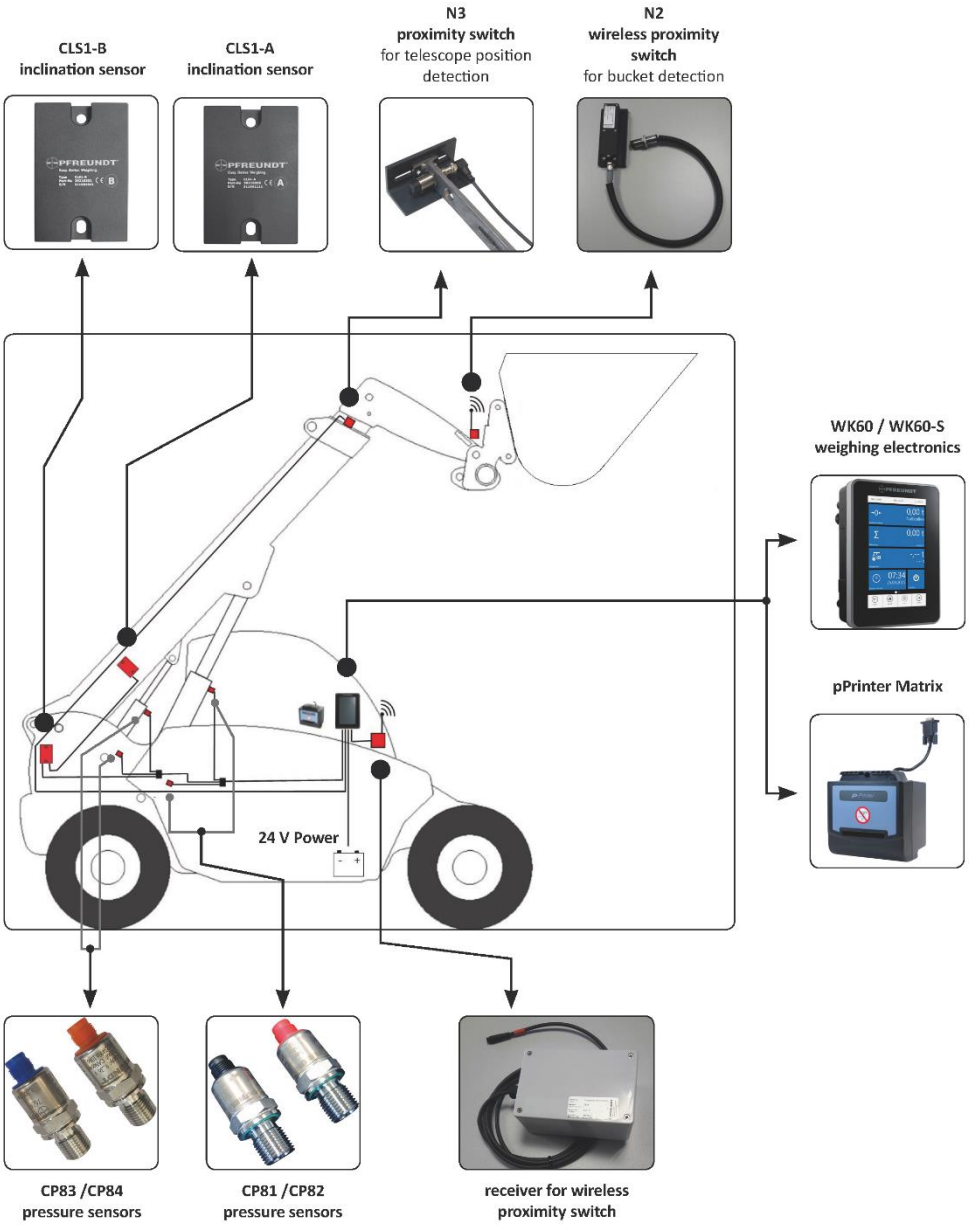
FIGURE 6/20A/13 – 1



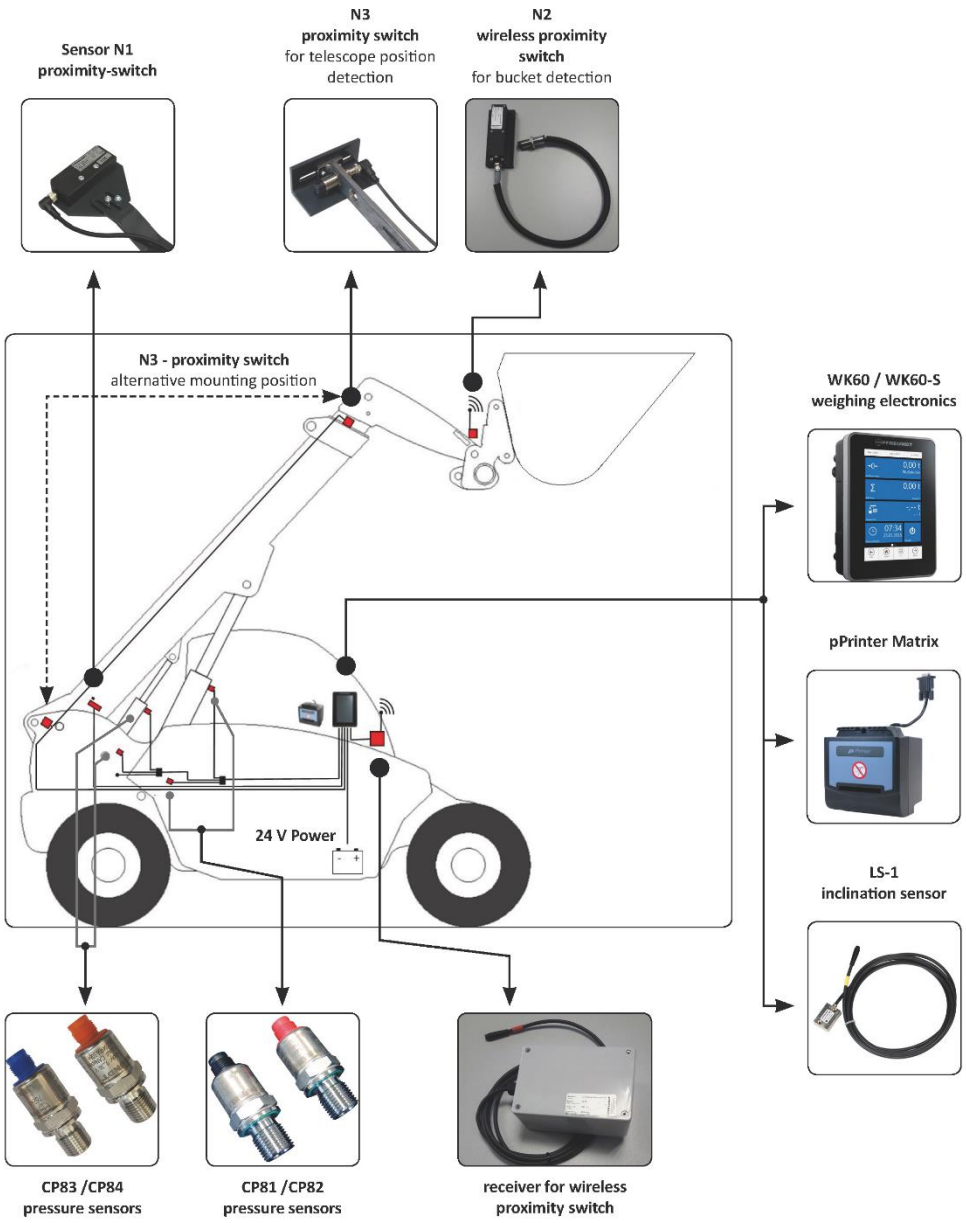
(a) Typical Pfreundt Model WK60 Wheeled Loader Weighing Instrument System Overview with Inclination Sensors (Pattern)



(b) Typical Pfreundt Model WK60 Wheeled Loader Weighing Instrument System Overview with Proximity Switches (Variant 1)



(c) Typical Pfreundt Model WK60 Telescopic Wheeled Loader Weighing Instrument System Overview with Inclination Sensors (Variant 3)

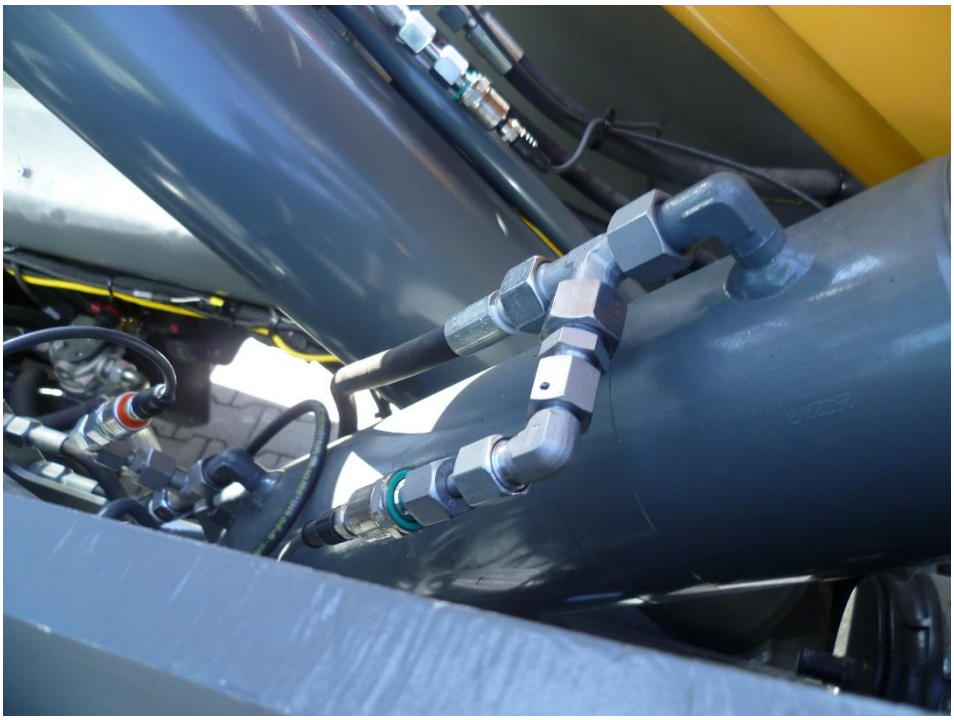


(d) Typical Pfreundt Model WK60 Telescopic Wheeled Loader Weighing Instrument System Overview with Proximity Switches (Variant 4)

(e) Typical Pfreundt Model WK60 Wheeled Loader Weighing Instrument (Pattern and Variant 1)

(f) Typical Pfreundt Model WK60 Telescopic Wheeled Loader Weighing Instrument (Variants 3 and 4)

FIGURE 6/20A/13 – 2



Typical Pfreundt Pressure Sensor Installation

FIGURE 6/20A/13 – 3

Pfreundt Model CLS1-# Boom Angle Sensor

FIGURE 6/20A/13 – 4

Pfreundt Model CLS1-# Bucket Location Sensor

FIGURE 6/20A/13 – 5

Pfreundt Model CLS1-# Chassis Inclination Sensor

FIGURE 6/20A/13 – 6

Pfreundt Model WK60 Control and Display Unit (Pattern)

FIGURE 6/20A/13 – 7

Pfreundt Model ᴘPrinter Printing Unit

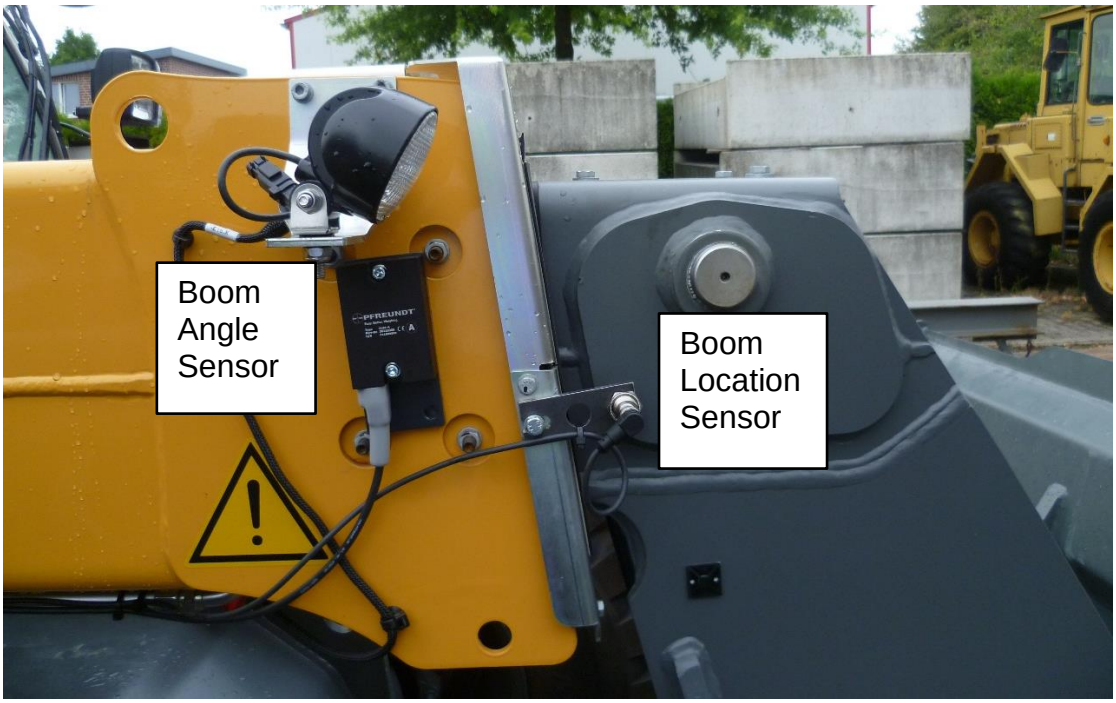
FIGURE 6/20A/13 – 8

(a) Pfreundt Model N1 Boom Angle Sensor

(b) Pfreundt Model N2 Bucket Location Sensor

(c) Pfreundt Model LS1 Inclination Sensor

FIGURE 6/20A/13 – 9

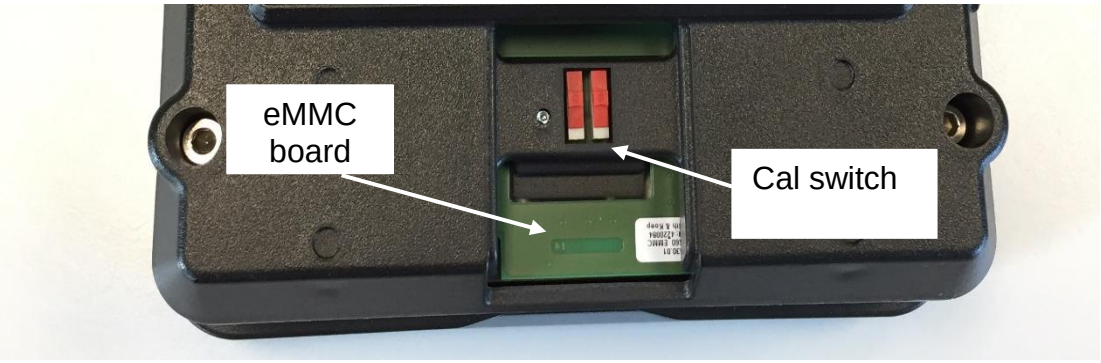


Boom Inclinometer and Location Sensor

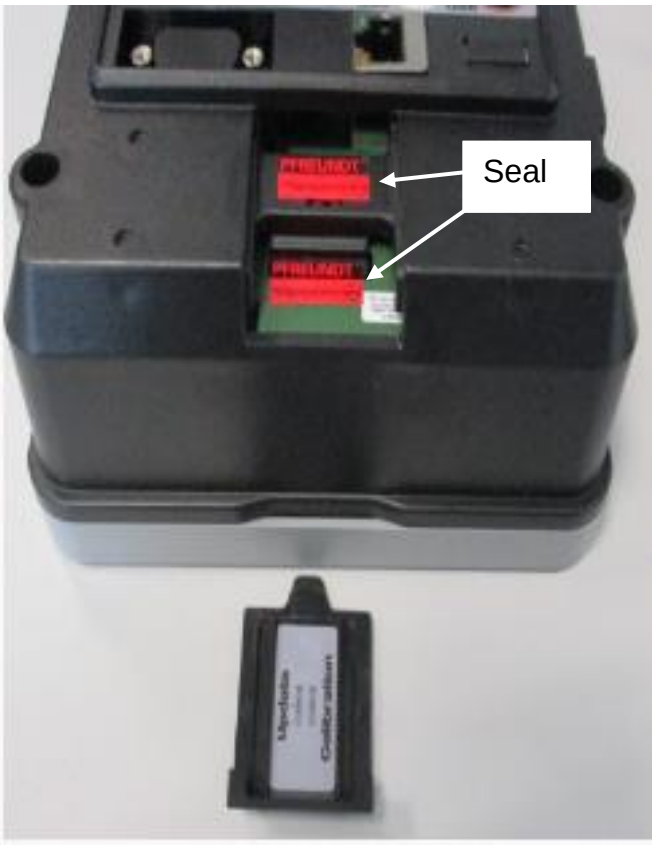
FIGURE 6/20A/13 – 10

Pfreundt Model N2 Bucket Location Sensor

FIGURE 6/20A/13 – 11



(a) WK60 Calibration Switch and eMMC Board



(b) Typical Sealing of WK60 Control and Display Unit

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